



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Northwest Region  
7600 Sand Point Way N.E., Bldg. 1  
Seattle, WA 98115

Refer to:  
2003/01342

January 14, 2004

Lawrence C. Evans  
Chief, Regulatory Branch  
Department of the Army  
Portland District, Corps of Engineers  
Post Office Box 2946  
Portland, OR 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Conference, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the American Bridge Company's Dock Construction, Umpqua River, Douglas County, Oregon (Corps No. 200200040)

Dear Mr. Evans:

Enclosed is a biological and conference opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of issuing a permit under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act to authorize the American Bridge Company's Dock Construction, Douglas County, Oregon. The Corps of Engineers (Corps) determined that the proposed action may adversely affect Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*), a species listed as threatened under the ESA, and OC steelhead (*O. mykiss*), a candidate species, and requested formal consultation and conferencing, respectively, for these species. NOAA Fisheries concludes in these Opinions that the proposed action is not likely to jeopardize the continued existence of OC coho salmon or OC steelhead.

Pursuant to section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with non-discretionary terms and conditions that NOAA Fisheries believes are necessary and appropriate to minimize the potential for incidental take associated with this project. However, this incidental take statement does not become effective for OC steelhead until that species is listed and the conference opinion is adopted as a biological opinion issued through formal consultation. If NOAA Fisheries reviews the proposed action and finds that no significant changes have been made in the action as proposed or in the information used in the conference, NOAA Fisheries will confirm the conference opinion as a biological opinion on the project and no further section 7 consultation will be necessary..



An essential fish habitat consultation is also enclosed pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and its implementing regulations (50 CFR Part 600). As required by section 305(b)(4)(A) of the MSA, this consultation includes conservation recommendations that NOAA Fisheries believes will avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from the proposed action. As described in the enclosed consultation, 305(b)(4)(B) of the MSA requires that a Federal action agency must provide a detailed response in writing within 30 days after receiving an EFH conservation recommendation.

Questions regarding this letter should be directed to Ken Phippen of my staff in the Oregon State Habitat Office at 541.957.3385.

Sincerely,

*for Michael R Crouse*

D. Robert Lohn  
Regional Administrator

cc: Teena Monical, COE  
Craig Tuss, USFWS  
Jim Brick, ODFW

# Endangered Species Act - Section 7 Consultation Biological Opinion and Conference Opinion

&

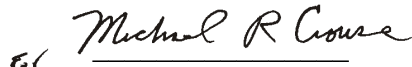
## Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

American Bridge Company's Dock Construction Project,  
Umpqua River, Douglas County, Oregon  
(Corps No. 200200040)

Agency: U.S. Army Corps of Engineers

Consultation  
Conducted By: National Marine Fisheries Service,  
Northwest Region

Date Issued: January 14, 2004

Issued by:   
D. Robert Lohn  
Regional Administrator

Refer to: 2003/01342

## TABLE OF CONTENTS

1. INTRODUCTION .....	<u>1</u>
1.1 Background .....	<u>1</u>
1.2 Consultation History .....	<u>1</u>
1.3 Proposed Action .....	<u>2</u>
1.4 Description of the Action Area .....	<u>3</u>
2. ENDANGERED SPECIES ACT .....	<u>4</u>
2.1 Biological Opinion .....	<u>4</u>
2.1.1 Biological Information .....	<u>4</u>
2.1.2 Evaluating Proposed Action .....	<u>8</u>
2.1.3 Biological Requirements .....	<u>8</u>
2.1.4 Environmental Baseline .....	<u>9</u>
2.1.5 Analysis of Effects .....	<u>10</u>
2.1.5.1 Direct Effects .....	<u>10</u>
2.1.5.2 Indirect Effects .....	<u>13</u>
2.1.6 Cumulative Effects .....	<u>16</u>
2.1.7 Conclusion .....	<u>17</u>
2.2 Incidental Take Statement .....	<u>17</u>
2.2.1 Amount or Extent of Take .....	<u>18</u>
2.2.2 Reasonable and Prudent Measures .....	<u>19</u>
2.2.3 Terms and Conditions .....	<u>19</u>
3. MAGNUSON-STEVENS ACT .....	<u>23</u>
3.1 Background .....	<u>23</u>
3.2 Identification of EFH .....	<u>24</u>
3.3 Proposed Actions .....	<u>25</u>
3.4 Effects of Proposed Action .....	<u>25</u>
3.5 Conclusion .....	<u>25</u>
3.6 EFH Conservation Recommendations .....	<u>25</u>
3.7 Statutory Response Requirement .....	<u>26</u>
3.8 Supplemental Consultation .....	<u>26</u>
4. LITERATURE CITED .....	<u>28</u>

## **1. INTRODUCTION**

### **1.1 Background**

On October 22, 2003, NOAA's National Marine Fisheries Service (NOAA Fisheries) received a letter from the Portland District of the U.S. Army Corps of Engineers (Corps) requesting formal consultation on the effects of issuing a permit under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act. On October 29, 2003, NOAA Fisheries received an updated biological assessment (BA), and on November 4, 2003, and November 6, 2003, NOAA Fisheries received additional information. The request for formal consultation was made pursuant to sections 7(a)(2) of the Endangered Species Act (ESA) and 305(b)(2) of the Magnuson-Stevens Fishery Management and Conservation Act (MSA). The proposed permit would authorize the American Bridge Company (ABC) to construct a new dock and implement a shallow habitat restoration/mitigation project on 0.085 acres (ac). Besides describing the proposed operation and the likely effects on aquatic resources, the Corps found that construction of the dock is likely to adversely affect Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*), an ESA-listed species and OC steelhead, a proposed species.

### **1.2 Consultation History**

On November 18, 2002, the Corps requested consultation for issuance of a permit authorizing Douglas County's Bolon Island Infrastructure Improvement Project (NOAA Fisheries Tracking No. 2002/01343), which included the following interrelated and interdependent (I/I) actions: (1) Constructing a bridge component manufacturing operation; (2) management offices; (3) removing an old dock; and (4) constructing a new dock. The Corps determined that the proposed action and the I/I actions may affect, but were not likely to adversely affect OC coho salmon or OC steelhead, and through informal consultation, NOAA Fisheries concurred with this determination on November 22, 2002.

In March 2003, the Corps issued a permit to ABC authorizing the removal of the old dock and construction of the new dock structure. The project, as originally proposed, included constructing a new 4,650 square foot (ft<sup>2</sup>) T-shaped dock within the footprint of an existing dock and did not involve the discharge of fill material. Since receiving approval from the Corps, ABC has modified their original project design. The new dock design is smaller than both the existing and the originally-proposed replacement dock, but it now requires the creation of a bulkhead with backfill to accommodate the structure. Because benthic habitat associated with the bulkhead will be permanently lost, a mitigation plan will be implemented whereby an equivalent value of similar habitat will be created nearby.

Due to these changes in the proposed action made by ABC, the Corps determined it was necessary to request formal consultation on the dock construction. A portion of the previous consultation, dock removal, was considered unchanged and therefore the Corps believed it was appropriate to continue with that permitted action. On October 21, 2003, NOAA Fisheries staff conducted a site visit with ABC personnel and consultants to review the proposed construction

site and the restoration/mitigation site. Two incomplete versions of the BA were received by NOAA Fisheries (October 3, 2003, and October 29, 2003) and a complete BA including all components (BA appendices B and C) was received on November 6, 2003.

### **1.3 Proposed Action**

The Corps proposes to issue a permit enabling ABC to construct a dock, 50 feet wide by 70 feet long, on fill material contained by a bulkhead. Sheet pile will be driven around the perimeter of the dock where current bottom depths range from -5 feet to -17 feet mean higher high water (MHHW). Once the sheet pile is completely installed, the interior of the structure will be backfilled with imported fill material. Fill material will be placed from shore using a backhoe or similar equipment.

Several two-foot wide walkways (equal to 500 ft<sup>2</sup>) will connect the dock to the derrick platform and will provide access for barge mooring. Five dolphin structures consisting of two 30-inch diameter pilings and two dolphin structures each consisting of three 30-inch diameter pilings will be built. Deck surface for the walkways will be steel support structure and steel grate. The main dock's surface will be unpaved, compacted rock aggregate. The BA describes conservation measures intended to reduce the impacts to water quality, OC coho salmon, OC steelhead and aquatic habitat.

Interrelated actions, as originally proposed (SPCA 2002), include ABC's construction of a steel fabrication plant and offices that will be on the northwest side of Bolon Island. As of the end of summer 2003, several facilities have been completed during Phase 1 of the project. These include a 48,000 ft<sup>2</sup> fabrication plant, a 12,000 ft<sup>2</sup> paint building, and a 10,000 ft<sup>2</sup> office complex. During the next phase (Phase 2), which is expected to continue through 2007, ABC plans to implement some initial steel component fabrication operations while adding an additional 48,000 ft<sup>2</sup> to the fabrication plant (for a total of 96,000 ft<sup>2</sup>). The fabrication plant will produce miscellaneous steel parts for bridge repair and new bridges, and the steel grid bridge deck systems. Production activities will consist primarily of cutting steel and welding, as well as some painting of steel surfaces. ABC expects that all facilities will be fully operational and certified by 2007.

The majority of ABC facility shipments, incoming and outgoing, will occur by truck transportation. The Oregon Department of Transportation has reviewed the proposed development and will not require any future improvements to Highway 101 at this location. Rail and barge transportation may be used if they compare favorably with the cost of trucking.

ABC proposes to mitigate the permanent loss of nearshore inter-tidal sand/mud flats resulting from creation of the bulkhead (approximately 0.0803 ac) and by potential bi-annual disturbance due to maintenance dredging (approximately 0.0558 ac) by restoring an equivalent area (*i.e.*, 0.085 ac based on the mitigation formula below) of Smith River mud flats just east of the Project impact site and north of the historic Bolon Island fill site. This site was considered to be an excellent candidate for restoration. Old fill material placed here decades ago covered both inter-

tidal marsh areas and mud flats. The goal is to excavate a comparable area at this location (approximately 0.085 ac) to restore lost mud flats and to revegetate the adjoining upland disposal area with a native shrub/tree riparian area. The mitigation area was calculated as follows:

$AM = (RVd/RVm) (AD)$ , where,

AM = Area of mitigation site (0.0817)

RVd = Adjusted Relative Value of the development site (=3)

RVm = Adjusted Relative Value of the mitigation site (=5)

AD = Area of development site (= 0.1361)

A full description of the mitigation plan is provided in Appendix C of the BA. The plan includes removing existing fill that eliminated an inter-tidal marsh and mudflat. Fill from approximately 0.085 ac will be excavated to recreate historic salt marsh and mudflat habitat. Approximately nine feet of fill overlays the mitigation site. Included in this action will be the planting of several native marsh species according to a planting design map (BA 2003 - Appendix C). Excavation will occur during periods of low tide when the mitigation area is not inundated with water. In addition, initial excavation will occur behind a ring of elevated material which will separate the excavation site from the river and prevent the release of sediments into nearby waters. Once the site is excavated to the required elevations inside the ring, the ring will be removed during a single low tide event. Success criteria were developed and proposed (section 4 of the BA 2003 Appendix C).

#### **1.4 Description of the Action Area**

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area (project area) involved in the proposed action (50 CFR 402.02). The direct effects occur at or beyond the project site based on the potential for upstream or downstream effects (*e.g.*, alteration of stream channel morphology, increases in total suspended solids (TSS), and displacement, injury to, or killing of coho salmon) in the action area. Indirect effects may occur at or beyond the project site when the proposed action leads to additional activities that contribute to aquatic habitat degradation. The proposed Project area lies just north of the City of Reedsport on Bolon Island in Douglas County, Oregon. The Project is in Reedsport Quadrangle, Township 21S, Range 12W, section 27. Bolon Island lies on the Umpqua River near its confluence with the Smith River. The island is about 11 river miles (RM) from the confluence of the Umpqua River with the Pacific Ocean at Winchester Bay. For this consultation, the action area includes the immediate dock construction site, an area 1,800 feet from the dock (potential sound pressure wave area), and the restoration site (approximately 1,000 feet from the dock site).

## **2. ENDANGERED SPECIES ACT**

### **2.1 Biological Opinion**

This biological and conference opinion (Opinion) considers the potential effects of the proposed action on OC coho salmon and OC steelhead, which occur in the proposed action area. OC coho salmon were listed as threatened under the ESA on August 10, 1998 (63 FR 42587) and protective regulations were issued on July 10, 2000 (65 FR 42422). OC steelhead were designated a candidate for listing due to concerns over specific risk factors on March 19, 1998 (63 FR 13347). The objective of this Opinion is to determine whether the proposed action is likely to jeopardize the continued existence of OC coho salmon or OC steelhead. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations, 50 CFR 402.

#### **2.1.1 Biological Information**

##### **OC Coho Salmon**

Although limited data are available to assess population numbers or trends, NOAA Fisheries believes that coho salmon stocks comprising the OC coho salmon evolutionarily significant unit (ESU) are depressed relative to past abundance. The OC coho salmon ESU is identified as all naturally-spawned populations of coho salmon in coastal streams south of the Columbia River and north of Cape Blanco (60 FR 38011, July 25, 1995). Biological information for OC coho salmon can be found in species status assessments by NOAA Fisheries (Weitkamp *et al.* 1995) and by the Oregon Department of Fish and Wildlife (ODFW) (Nickelson *et al.* 1992).

Abundance of wild coho salmon spawners in Oregon coastal streams declined from roughly 1965 to 1975, and has fluctuated at a low level since then (Nickelson *et al.* 1992). Spawning escapements for this ESU may be less than 5% of that in the early 1900s. Contemporary production of coho salmon may be less than 10% of the historic production (Nickelson *et al.* 1992). Average spawner abundance has been relatively constant since the late 1970s, but preharvest abundance has declined. Average recruits-per-spawner may also be declining. The OC coho salmon ESU, although not at immediate danger of extinction, may become endangered in the future if present trends continue (Weitkamp *et al.* 1995). Preliminary findings of the Biological Review Team (BRT 2003) indicate that recent increases in spawner escapement levels are likely due to good ocean productivity while freshwater productivity continues to decline. Continued degradation of freshwater habitat that results in decreased productivity may lead to localized extinction during the next low ocean productivity cycle (BRT 2003).

The Umpqua River drains approximately 4,900 square miles. The Umpqua River is unique within the OC coho salmon ESU because it has headwaters in the Cascade Mountains, runs through the Coast Range and then enters the Pacific Ocean. No other OC coho salmon river traverses the coast range to the Cascade Mountains. Four populations of coho salmon occur within the Umpqua River (ODFW 1995). They are the Smith River, the Mainstem Umpqua

River, the North Umpqua River, and the South Umpqua River. Migrating adults and out-migrating smolts from all populations pass through the action area. The abundance of OC coho salmon in the Umpqua River basin varies by month and life history stage (Table 1).

**Table 1.** OC Coho Salmon Life History Events for the Umpqua River Basin (Weitkamp 1995, Steelquist 1992). Light shading represents low-level abundance, dark shading represents peak abundance.

	J	F	M	A	M	J	J	A	S	O	N	D
River Entry												
Spawning												
Intragravel Development												
Juvenile Rearing												
Juvenile Out-migration												

Adult OC coho salmon enter the Umpqua River from September through February and migrate through the action area, up the system to the tributaries. Spawning typically occurs from late November through early February. Juvenile coho salmon spend one year in freshwater before smoltification. During the summer, juveniles typically seek thermal refugia and cover in smaller tributary streams, but may be forced into larger streams and rivers due to declining water discharge in August and September.

#### Returning Adults and Spawning

No spawning occurs in the action area because it is tidally-influenced, but adults from all four populations of OC coho salmon in the Umpqua must migrate through the action area (ODFW 1995). ODFW counts all of the OC coho salmon returning to the North Umpqua at a counting station in Winchester dam. Escapement estimates are made for the rest of the Umpqua River basin. The proposed in-water work window is November 1 through January 31. During this time period migrating adult spawners will be passing through the action area.

**Table 2.** Counts and Estimates of Wild Adult OC Coho Salmon Returning Through the Project Area.<sup>1</sup>

	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>North Umpqua River count</b>	1,012	1,162	1,570	1,329	909	1,065	1,506	2,449	3,069
<b>Basin above Elkton estimate</b>	4,485	11,349	9,749	2,233	8,426	6,466	10,395	32,751	35,301
<b>Total</b>	5,497	12,511	11,319	3,562	9,335	7,946	11,901	35,200	38,370

### Juvenile Rearing

The action area is designated as rearing habitat (ODFW 2003a). It is difficult to estimate the number of juvenile OC coho salmon rearing in the action area throughout the year. During the wet season (November through April), water quality and habitat parameters are adequate to allow juveniles to rear in the action area. Salinities are less than 10 parts per thousand upstream of approximately river mile (RM) 4 (Ratti 1979), low enough to not limit use by OC coho salmon juveniles. Fish are likely to be concentrated near shorelines where habitat is more complex, more food is available, and the current is slower. During the dry season (May through September), water temperatures rise. The Umpqua River from RM 11.8 to 25.9 is listed on the Oregon Department of Environmental Quality (ODEQ) 303(d) List of Water Quality Limited Water Bodies for temperature. The seven-day average of daily maximums was 80.5 and 79.1 degrees Fahrenheit in 1990 and 1992, respectively. This likely limits the number of juvenile OC coho salmon during the summer months. Individuals that are present likely use thermal refuges where cool interstitial flows occur in the substrate.

### Juvenile Outmigration and Acclimation

The Umpqua River estuary plays a critical role in the survival and recovery of listed or proposed salmon, by providing refuge, nutrients, and conditions in which juvenile salmon change physiologically from a freshwater to a saltwater organism. Outmigrating OC coho salmon smolts from all four Umpqua Basin populations use the action area to acclimate to saltwater conditions. In the Umpqua River during juvenile outmigration time, this interface occurs between RM 4 and the head of tide at RM 27. The Umpqua estuary has not been studied with respect to coho salmon use, but in a study of OC coho salmon on a tributary to Coos Bay, Miller (2003) found that smolts resided in the saltwater interface area for an average of 14 days. While in this transitional habitat, the juveniles seek out cover, such as large woody debris, boulders, vegetation or overhanging banks (McMahon and Holtby 1992). During this time they undergo rapid growth (Holtby *et al.* 1990).

---

<sup>1</sup> Adapted from ODFW, Annual estimates of wild coho spawner abundance in coastal river basins within the Oregon Coastal ESU, 1990-2002, available online at: <http://oregonstate.edu/Dept/ODFW/spawn/coho.htm>

It is difficult to estimate the number of OC coho salmon smolts outmigrating through the action area. In 2000, the Bureau of Land Management (BLM) operated rotary screw traps in five watersheds of the Umpqua River drainage. These watersheds cover a considerable range of habitat conditions and OC coho salmon population levels, but only account for approximately 12.5% of the Umpqua River drainage above the project area. While it is typically not appropriate to extrapolate under these circumstances, the following calculation represents the best available data and will only be used as a very rough estimate. In 2000, the BLM estimated 61,588 OC coho salmon smolts left for the ocean from the five streams they sampled. Extrapolating that number of smolts to the rest of the basin gives an estimate of 500,000 OC coho salmon smolts. This is the best approximation of the population level of outmigrating smolts from areas other than the Smith River drainage.

## OC Steelhead

Steelhead have the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations. Within the range of west coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. In any given river basin, there may be one or more peaks of migration activity, and since these *runs* are generally named for the season in which they occur, some rivers may have runs known as winter, spring, summer, or fall steelhead. Through time, the names of seasonal runs have generally been simplified; in the Pacific Northwest, winter and summer steelhead runs are commonly identified. The Umpqua River has both of these runs. North American steelhead commonly spend two years in the ocean before entering freshwater to spawn. Summer steelhead enter fresh water up to a year before spawning. Steelhead may spawn more than once. In some cases, the separation between anadromous steelhead and rainbow trout is obscured.

The OC steelhead ESU occupies river basins on the Oregon coast north of Cape Blanco; excluded are rivers and streams that are tributaries of the Columbia River. Native OC steelhead are primarily winter steelhead; native summer steelhead occur only in the Siletz and Umpqua River Basins. Recent genetic data for steelhead in this ESU show a level of differentiation from populations from Washington, the Columbia River Basin, and coastal areas south of Cape Blanco. Ocean migration patterns also suggest a distinction between steelhead populations north and south of Cape Blanco. Steelhead, as well as chinook (*O. tshawytscha*) and coho (*O. kisutch*) salmon, from streams south of Cape Blanco tend to be south-migrating rather than north-migrating. Most steelhead populations within this ESU have been increasing range wide over the last three years. Although in past years hatchery programs were a significant concern for this ESU, stray rates have decreased and the incorporation of wild steelhead into hatchery programs has reduced the concern (Kruzic 1998). Significant changes have been implemented after 1994, and the benefits to steelhead populations have not been fully realized. Angling regulation changes, including no retention of wild juvenile and adult steelhead, prohibiting use of bait in trout fisheries, and establishing sanctuary areas that are closed to all fishing, will substantially reduce fisheries impacts. Recent changes in hatchery programs, such as development of locally-

adapted broodstocks, reductions in the number of hatchery fish released, and improved homing fidelity, will reduce straying of hatchery fish into the natural environment (Kruzic 1998).

### **2.1.2 Evaluating Proposed Action**

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402.02 (the consultation regulations). In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the five steps of the consultation regulations and when appropriate combines them with the Habitat Approach (NOAA Fisheries 1999). The steps are as follows: (1) Consider the biological requirements of the listed species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species; and (4) determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species. If jeopardy is the appropriate determination, then NOAA Fisheries proceeds with step 5. In step 5, NOAA Fisheries may identify reasonable and prudent alternatives (RPAs) for the action that avoid jeopardy, if any exists.

The fourth step above requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (*i.e.*, effects on essential habitat features). The second part focuses on the species itself. It describes the action's effects on individual fish, or populations, or both, and places these effects in the context of the ESU as a whole. Ultimately, the analysis seeks to answer the question of whether the proposed action is likely to jeopardize a listed species' continued existence.

### **2.1.3 Biological Requirements**

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. The biological requirements are population characteristics necessary for OC coho salmon and OC steelhead to survive and recover to naturally-reproducing population levels, at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance its capacity to adapt to various environmental conditions, and allow it to become self-sustaining in the natural environment.

For actions that affect habitat, NOAA Fisheries usually describes the habitat portion of a species' biological requirements in terms of a concept called properly functioning condition (PFC). PFC is defined as the sustained presence of natural, habitat-forming processes in a watershed that are

necessary for the long-term survival of the species through the full range of environmental variation (NOAA Fisheries 1999). PFC, then, constitutes the habitat component of a species' biological requirements. Survival of OC coho salmon and OC steelhead in the wild depends upon the proper functioning of ecosystem processes, including habitat formation and maintenance. Restoring functional habitats depends largely on allowing natural processes to increase their ecological function, while at the same time removing adverse effects of current practices. For this consultation, the biological requirements are improved habitat characteristics that would function to support successful adult holding and migration, and juvenile rearing, smoltification and outmigration.

Both coho salmon and steelhead have similar basic biological requirements. These requirements include: Food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), riparian vegetation, clean spawning substrate, and unimpeded migratory access to and from spawning and rearing areas (adapted from Spence *et al.* 1996).

#### **2.1.4 Environmental Baseline**

In step two of NOAA Fisheries' analysis, we evaluate the relevance of the environmental baseline in the action area. Regulations implementing section 7 of the ESA (50 CFR 402.02) define the environmental baseline as the past and present effects of all Federal, state, or private actions and other human activities in the action area. The environmental baseline also includes the anticipated effects of all proposed Federal projects in the action area that have undergone section 7 consultation, and the effects of state and private actions that are contemporaneous with the consultation in progress.

Land uses in the action area include rural, residential, agricultural, commercial, industrial, and forestry. Riparian areas and stream channels in the action area have been damaged by development activities related to these land uses, as well as by the use of splash dams, and in-stream gravel mining throughout the watershed (FEMAT 1993, Botkin *et al.* 1995, OCSRI 1997).

Habitat changes that have contributed to the decline of OC coho salmon and OC steelhead in the action area include: (1) Reduced biological, chemical, and physical connectivity between streams, riparian areas, floodplains, and uplands; (2) elevated fine sediment yields; (3) reduced instream large woody debris; (4) loss or degradation of riparian vegetation; (5) altered stream channel morphology; (6) altered base and peak stream flows; and (7) loss of estuarine shallow habitat, including submerged and emergent aquatic vegetated areas (OCSRI 1997). The Umpqua River is on the ODEQ 303(d) List of Water Quality Limited Water Bodies for temperature.

### **2.1.5 Analysis of Effects**

The proposed action consists of constructing and operating a dock and removing fill to create shallow water habitat. These actions will produce a sequence of direct effects that will begin immediately at the project site, and will eventually be felt as a chain of indirect effects that will occur later in time and spread across a larger upstream and downstream area. The direct effects of the proposed dock construction activities include: (1) Degradation of water quality (turbidity and contaminants); (2) sound pressure waves generated by pile driving; and (3) permanent removal of 0.0803 ac of nearshore mud flats due to creation of the bulkhead. Potential indirect effects include: (1) Reduction of forage; (2) degradation of nearshore and shoreline habitat; (3) the creation of predator refugia; (4) changes in littoral productivity; and (5) increased barge and boating activity. The most important long-term habitat effects would be filling of existing shallow water habitat and fill removal, intended to create shallow water habitat. This fill removal may recreate high quality habitat. The most important biological effects would be reduction of macroinvertebrate production, pollution effects, and impairment of essential biological behaviors related to rearing, migrating, feeding and sheltering, in the action area. The effects analysis presented in this section is based on information in the BA and supplementary material.

#### **2.1.5.1 Direct Effects**

##### Water Quality

Water quality will be affected by an increase in turbidity levels. Dock construction is expected to produce some elevated turbidity levels. Elevated turbidity levels are expected to be short-term and not exceed lethal thresholds. Exposure duration is a critical determinant of the occurrence and magnitude of turbidity caused physical or behavioral turbidity effects (Newcombe and MacDonald 1991, Newcombe and Jensen 1996). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such seasonal high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). Migrating adult coho salmon will be the most likely life-history stage present in the action area at the time of implementation (November 1 through January 31). As previously identified, salinities would not prevent juvenile coho salmon from inhabiting this area. Turbidity levels are not expected to exceed any threshold that would prevent the migrating adults from passing through the action area nor create an exposure duration or magnitude that would result in lethal doses to juvenile salmonids.

Water quality may also be degraded by the introduction of hazardous compounds that may affect OC coho salmon and OC steelhead may be introduced into the water by: (1) Re-suspension of contaminants presently within sediments; (2) re-introduction of contaminants due to runoff from dredging materials; and (3) accidental contaminant spills from construction equipment operation. These potential sources of hazardous materials pose different levels of risk.

Dredging and excavation activities have the potential to re-suspended bedded contaminants or unearth buried contaminants adhered to sediment and soil particles. Once delivered into the waterbody, those contaminants act as new contaminant sources to benthic invertebrates and fish. The suspended, contaminated particles can re-settle onto a new site, affecting a previously undisturbed benthic population, or be taken up directly or indirectly by fish. Upland disposal areas can also produce contaminated runoff. The applicant proposes to adhere to the sediment testing procedures and standards required by NOAA Fisheries' criteria.<sup>2</sup> However, sediment contaminant testing has not yet been completed. If testing eventually raises concerns about the effects of dredged material on aquatic life, the Corps must reinitiate this consultation. Therefore due to this unavailable information and for the purpose of this assessment, it is assumed the sediment testing will result in satisfactory results. Spoil disposal is proposed for an upslope site and will be isolated from the river.

Operation of the construction equipment and dredging equipment requires the use of fuel, lubricants, and other petroleum products, which, if spilled into the bed or channel or into the riparian zone of a waterbody during construction could injure or kill aquatic organisms. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain polycyclic aromatic hydrocarbons (PAHs) which can cause acute toxicity to salmonids at high levels of exposure, and can also cause chronic lethal as well as acute and chronic sublethal effects to aquatic organisms (Neff 1985, Hatch and Burton 1999). Hazardous material spills require immediate control to limit the extent of impacts. Spill of petroleum-based materials can rapidly migrate downstream from a site. This problem must be addressed through proactive practices, such as absorbent booms and other control measures. To ensure that spills will be prevented, a pollution control plan will be prepared and carried out (BA 2003). Spilling of petroleum-based products due to accident is a higher direct risk than the chronic exposure due to boat operation.

#### Shallow Water Habitat

Dock construction will lead to elimination of shallow water habitat. Channel fill and dredging reduces the available low velocity, shallow water habitats, which appear to be especially important to salmon in the estuary (Bottom and Jones 1990, Dawley *et al.* 1986). These shallow water habitats provide areas for refuge and feeding. McMahon and Holtby (1992) found coho salmon smolts sought cover as they migrated through the estuary. Filling the channel area eliminates shallow complex habitat and eliminates any future recovery of this habitat at this site. Dredging will increase channel depth, therefore potentially limiting aquatic macrophyte growth. Structural and biological features of estuarine habitats that provide refugia from predators and off-channel areas protected from strong tidal and river currents are important to salmon survival. Complex dendritic tidal channel systems and other landforms (islands, peninsulas, *etc.*), wood, submerged and emergent vegetation, or other structural components and connections between mainstem channels and floodplains can minimize effects of predators and strong flows.

---

<sup>2</sup> See, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, and Washington Department of Natural Resources, Dredged Material Evaluation Framework: Lower Columbia River Management Area (DMEF) (November 1998) procedures to determine sediment quality for dredging activity (<http://www.nwp.usace.army.mil/ec/h/hr/Final/>).

Potential shallow water habitat value of the dock site appears to be marginal based on the limited existing submergent vegetation in adjacent areas and the substrate conditions, but any potential for increasing the habitat values will be either eliminated or degraded due to the proposed actions. Shallow water habitat at the site of the proposed dock is degraded due to the existing dock and the local land form features. The existing habitat is characterized as a moderately sloping substrate of fine sediments. Only sparse vegetation occurs in the immediate vicinity of the existing dock. The BA (2003) describes the new dock footprint as “unconsolidated bottom” which is defined as an area with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%. Soil sampling in the area indicates that the substrate consists of poorly graded sand. This area is considered marginal habitat due to the lack of vegetation and fine substrate, but this habitat will either degraded by the dock walkways or eliminated due to the bulkhead construction.

The action contains a proposal to restore the habitat values eliminated or degraded at the dock and dredging locations by recreating shallow water habitat at a nearby location. This will be accomplished by removal of fill from 0.085 ac of Bolon Island, which is expected to result in the creation of saltwater marsh and mud flat habitat. Prior to the expansion and development of Bolon Island, this area was likely high quality saltwater marsh and mud flat. The probability for a successful restoration of this site should be considered very high. This site is expected to provide shallow water habitat utilized by juveniles, smolts, and adult OC coho salmon for seasonal rearing, foraging, and out-migration acclimation. Adult OC steelhead are also expected to utilize this area. When vegetation becomes reestablished, increased habitat values will include forage production, refugia from strong tidal and river currents, and hiding cover. Although the physical area is smaller in the mitigation site compared to the dock and dredge sites, the habitat values lost and gained are expected to be equal after the new site reaches its full potential. This may take several years and will be monitored for five years to ensure potential habitat values are fully obtained.

### Sound Pressure Waves

Intense underwater sound pressure levels (SPLs) from pile driving are expected to have the greatest potential for direct effects to OC steelhead and OC coho salmon. Pile driving will cause temporary, intense underwater sound pressure waves. Specific decibels (dB) that may injure fish varies with many factors (Hanson *et al.* 2003). The degree to which an individual fish exposed to sound will be affected is dependent upon a number of variables, including: (1) Fish species, (2) fish size, (3) presence of a swimbladder, (4) physical condition of the fish, (5) peak sound pressure and frequency, (6) shape of the sound wave (rise time), (7) depth of the water around the pile, (8) depth of the fish in the water column, (9) amount of air in the water, (10) size and number of waves on the water surface, (11) bottom substrate composition and texture; (12) effectiveness of bubble curtain sound/pressure attenuation technology, (13) tidal currents/river current, and (14) presence of predators. Sound waves in excess of 190dB may be fatal to fish, however 155dB may be sufficient to stun small fish (Hanson *et al.* 2003).

The high SPLs caused by pile driving in this action would likely elicit an evasive response from salmonids. This evasive response could in turn result in juvenile fish abandoning predator

refugia or local foraging areas, temporarily increasing risks of predation, or diminishing foraging opportunities. Few if any juvenile OC coho salmon are likely to be in this area at the time this project is implemented (November 1 through January 31). In the marine environment, Feist (1991) and Feist *et al.* (1992 and 1996) have demonstrated that pile driving has tangible effects on salmonids. They concluded salmonids may detect pile driving sound within a radius of 1,800 feet of the sound source and pile driving operations may affect the general behavior and distribution of salmonids.

Adult coho salmon and OC steelhead may likely be moving through this area. Of the proposed project activities, pile driving will have the greatest potential for direct effects to individual fish. Bolon Island has the main channel of the Umpqua River to its south and the Smith River confluence on the north. No migration data exists to disclose which channel the migrating adults from the Smith River population of OC coho salmon may utilize or prefer, but they could enter the Smith River without entering the area influenced by any pile driving. All other populations must pass through this portion of the action area.

The Umpqua River channel width is approximately 1,000 feet at this site, therefore it is possible for the entire channel to be within the effected area of the sound pressure wave. A constant, intense noise disturbance from a pile driving installation could delay the movement of adults through a narrow channel. Potential effects to the population of migrating adult coho salmon will diminish as the migration period reaches its tail-end (January), because almost all adults will have moved through the area. Any late-running groups could still be affected. Winter-run steelhead will move through the area later than OC coho salmon, therefore, there may be a greater number of migrating adults in the area at the end of the in-water work period. Based on these factors and the lack of any proposed minimization methods (bubble curtains, dampening blocks, or equipment - vibratory hammer) pile driving appears to have the most significant potential for affecting OC coho salmon and OC steelhead.

#### **2.1.5.2 Indirect Effects**

Potential indirect effects include reduction of forage, degradation of nearshore and shoreline habitat, the creation of predator refugia, changes in littoral productivity, introduction of hazardous materials, and the I/I action of increased barge and boat traffic.

##### Macroinvertebrate/Forage Production

Dredging and channel fill alters salmonid food webs by eliminating shallow water estuarine habitat, where food webs are based on submerged and emergent marsh vegetation and infauna (Bottom and Jones, 1990; Dawley *et al.*, 1986). These food webs are more likely to directly support salmonid productivity than ones in large open channels (Bottom *et al.*, 1984; Salo, 1991). Holtby *et al.* (1990) states that rapid growth during estuary rearing may reduce vulnerability to nearshore predators, which are believed to be a major source of ocean mortality for coho salmon. Eliminating 0.0803 ac of shallow-water habitat by constructing the dock bulkhead will affect aquatic invertebrate populations and productivity.

Interstitial spaces and aquatic vegetation provide habitat for the invertebrate communities that are a major food source for all age classes of salmon. Macroinvertebrates move, rest, find shelter, and feed on the substrate and vegetation. Elimination of macroinvertebrate habitat as well as removal of individuals during dredging will have an indirect effect on salmonids dependent on these organisms for food.

Reduced food sources, particularly when combined with higher temperatures, will result in decreased growth rates or reduced survival (Brett *et al.* 1982, Rich 1987), as fish need higher food intakes to maintain homeostasis at higher temperatures due to reduced conversion efficiencies (Smith and Li 1983). Vegetation-oriented macroinvertebrates are affected either by physical destruction of vegetation, turbidity concentrations, or by bed elevation lowering, which reduces the shallow water estuarine habitat where vegetation can grow. Food webs based on vegetation are more likely to directly support salmonid productivity than ones in large open channels (Bottom *et al.*, 1984; Salo, 1991).

Shading from overwater structures may also reduce prey organism abundance and the complexity of the habitat by reducing aquatic vegetation and phytoplankton abundance (Kahler *et al.* 2000, Hass *et al.* 2002). Glasby (1999) found that epibiotic assemblages on pier pilings at marinas subject to shading were markedly different than in surrounding areas. Other studies have shown shaded epibenthos to be reduced relative to that in open areas. These factors are thought to be responsible for the observed reductions in juvenile fish populations found under piers and reduced growth and survival of fishes held in cages under piers, when compared to open habitats (Able *et al.* 1998, Duffy-Anderson and Able 1999).

Another indirect effect of this project on OC coho salmon and OC steelhead is a potential reduction of aquatic macroinvertebrates due to the effects of toxic substances, such as petroleum product spills (Hatch and Burton 1999, Ireland *et al.* 1996). Toxicity of PAHs to macroinvertebrates increases with the organisms exposure to ultraviolet light (Ireland *et al.* 1996, Hatch and Burton 1999, Monson *et al.* 1995). The implementation of a spill containment plan will reduce the risk due to accidents during construction.

The development of shallow water habitat through the restoration action is expected to result in forage production for OC coho salmon and OC steelhead. Recovery rate of the shallow water habitat may take several years to completely develop the habitat value potential, therefore this benefit will be realized later in time. This area is approximately 1,000 feet from the dock and dredging location, therefore some displacement of the habitat values will occur due to this action.

#### Predator Refugia

Overwater structures create conditions that provide benefits to predators of juvenile salmonids (Hansen *et al.* 2003). Fishes rely on visual cues for spatial orientation, prey capture, schooling, predator avoidance, and migration. The reduced-light conditions found under an overwater structure limit the ability of fishes, especially juveniles and larvae, to perform these essential activities. The shadow cast by an overwater structure may increase predation on juvenile

salmonids by creating a light/dark interface that allows ambush predators to remain in a darkened area (barely visible to prey) and watch for prey to swim by against a bright background (high visibility) (Helfman 1981). Prey species moving around the structure are unable to see predators in the dark area under the structure and are more susceptible to predation. Furthermore, the reduced vegetation densities associated with overwater structures and dredging decrease the available refugia from predators.

#### Interrelated and Interdependent Actions

Boat traffic required to move barges into the dock for off-loading components and loading products will change from the current traffic conditions due to this proposed dock construction. An increase in the number and size of vessels can generate more wave and surge effects on shorelines. These vessel-wake wash events can affect shorelines depending on the wake wave energy, the water depth, and the type of shoreline. Vessel wakes can cause significant increase in shoreline erosion, impact wetland habitat, and increase water turbidity, all of these may result in decreases in food web production. Vessel prop wash can also damage aquatic vegetation and disturb sediments which may increase turbidity and suspend contaminants (Klein 1997, Warrington 1999). Changes in prey communities under ferry terminals have been attributed, in part, to prop wash from ferries (Blanton *et al.* 2001, Haas *et al.* 2002). The magnitude of this action's affect on boat traffic is not known, but is expected to be less than the activity of a ferry terminal, but certainly greater than baseline traffic. These vessels will also be another source for hazardous materials contamination due to fuel leaks and spills.

#### Infrastructure Development

The long-term operation of this facility is expected to create and support approximately 120 jobs. The addition of these jobs is not expected to significantly increase anthropogenic effects on OC coho salmon or OC steelhead because the majority of these people are expected to be local and any increase in population is expected to be accommodated by current infrastructure and services.

#### Impairment of Essential Biological Behaviors

The proposed dock construction and I/I actions may reduce physical and chemical habitat quality in the action area. These changes affect individual OC coho salmon and steelhead by impairing behaviors related to migration, rearing, feeding, and transition to adulthood. Young salmon are generally able to avoid adverse habitat conditions if those circumstances are limited to areas that are small compared with the total habitat area. Thus, juvenile salmon compensate for increased fine sediment in the channel and temporary loss of productive shallow-water habitats by displacing themselves to other areas. Those juveniles may be forced to leave freshwater prematurely. Alternatively, they may continue to survive in the system, if a suitable alternative habitat can be found, but the energetic price of displacement can be substantial if it results in greater competition, overcrowding, or movement to a less productive area.

The proposed action would take place in an area that serves multiple critical functions in the life history of juvenile OC coho salmon. One of these functions is unique to the transition zone between fresh and salt water, where juvenile OC coho salmon spend an extended time each

spring while their bodies adjust to higher salinities. This is a unique resource for individuals in these subpopulations. Thus, individual salmon cannot compensate for loss or degradation of tidally-influenced habitats in the Umpqua River by simply traveling to another area. The restoration of previously lost shallow-water habitat will provide an alternative location for the juvenile salmonids to inhabit. This restoration site is approximately 1,000 feet from the dock location and does not represent a significant distance for relocation.

At the population level, the effects to the environment are understood to be the integrated response of individual organisms to environmental change. Instantaneous measures of population characteristics, such as population size, growth rate, spatial structure, and diversity, are the sums of individual characteristics within a particular area, while measures of population change, such as a population growth rate, are measured as the productivity of individuals over the entire life cycle (McElhany *et al.* 2000). A persistent change in the environmental conditions affecting a population, for better or worse, can lead to a similar change in each of these population characteristics.

Coho salmon spawning in some North and South Umpqua River tributaries have much longer migrations (~200 mi) than those in most other Oregon populations (Kostow 1995), extending into the Cascade Mountains. The Umpqua River supports approximately 24% of the total OC coho salmon population (ODFW 2003b). Of the four subpopulations of OC coho salmon occurring in the Umpqua Basin (ODFW 1995), at least three must migrate through the action area to spawning areas in the upper tributaries. It is very likely that these fish are distinct from those in all other coastal drainages (BRT 2003; McElhany *et al.* 2000).

#### **2.1.6 Cumulative Effects**

Cumulative effects are defined in 50 CFR 402.02 as “those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.” Other activities within the watershed have the potential to impact fish and habitat within the action area.

NOAA Fisheries is not aware of any specific future non-federal activities within the action area that would cause greater effects to listed species than presently occurs. The action area includes tracts of private lands. Land use on these non-federal lands include rural development, agricultural, and commercial forestry. Chemical fertilizers or pesticides are used on many of these lands, but no specific information is available regarding their use. NOAA Fisheries does not consider the rules governing timber harvests, agricultural practices, and rural development on non-federal lands within Oregon to be sufficiently protective of watershed, riparian, and stream habitat functions to support the survival and recovery of listed species. Therefore, these habitat functions likely are at risk due to future activities on non-federal forest lands within the basin.

Between 1990 and 2000, the human population in Douglas County increased by 6.1%.<sup>3</sup> Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, increasing as population density rises. Bridge components will continue to be needed as road infrastructure is maintained to transport goods and services to these people.

### **2.1.7 Conclusion**

The fourth step in NOAA Fisheries' jeopardy analysis is to decide whether the proposed action, considering the above factors, is likely to appreciably reduce the likelihood of the species' survival and recovery in the wild. For the jeopardy determination, NOAA Fisheries uses the consultation regulations and the Habitat Approach (NOAA Fisheries 1999) to come to a conclusion about whether actions would further degrade the environmental baseline or hinder attainment of proper functioning conditions at a spatial scale relevant to the listed ESU.

Although some nearshore aquatic habitat will be periodically disturbed, the amount will be minimized and the implementation of the proposed restoration plan will result in no net loss of aquatic habitat and its functions. The implementation of conservative design criteria reduce impacts to nearshore and aquatic habitats to the extent that overall baseline habitat functions will not be appreciably reduced.

After reviewing the current status of OC coho salmon and OC steelhead, the environmental baseline for the action area, the effects of the proposed action and its cumulative effects, NOAA Fisheries has determined that this action, as proposed, is not likely to jeopardize the continued existence of these species.

This concludes the conference for the effects of the American Bridge Company's Dock Construction on the candidate species OC steelhead. The Corps may ask NOAA Fisheries to confirm the conference opinion as a biological opinion issued through formal consultation if the species is listed in the future. The request must be in writing. If NOAA Fisheries reviews the proposed action and finds that no significant changes have been made in the action as proposed or in the information used in the conference, NOAA Fisheries will confirm the conference opinion as a biological opinion on the project and no further section 7 consultation will be necessary.

## **2.2 Incidental Take Statement**

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." [16 USC 1532(19)] Harm is defined by

---

<sup>3</sup> U.S. Census Bureau, State and County Quickfacts: Douglas County, Oregon. Available online at <http://quickfacts.census.gov/qfd/states/41/41019.html>

regulation as “an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering.” [50 CFR 222.102] Harass is defined as “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.” [50 CFR 17.3] Incidental take is defined as “takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant.” [50 CFR 402.02] The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

This incidental take statement does not become effective for OC steelhead until that species is listed and the conference opinion is adopted as a biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the species has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take.

### **2.2.1 Amount or Extent of Take**

OC coho use the action area for smoltification, rearing, holding, and migration, in juvenile and adult life histories. Therefore, they are likely to be present in the action area while the effects of the action are manifest. Since OC coho will be exposed to these effects, incidental take of OC coho is reasonably certain to occur. Incidental take will most likely occur in the form of “harm” or habitat modification that interferes with normal behavioral patterns, including those mentioned above. Despite the use of the best available information, estimating the number of fish that might be injured or killed by habitat modifying activities is difficult, if not impossible. In such circumstances, the anticipated amount of take is characterized as “unquantifiable.”

For those consultations for which incidental take is unquantifiable, NOAA Fisheries estimates the extent of take anticipated in relation to the anticipated extent of habitat modification. For the proposed action, the extent of take anticipated is that which would accrue from the temporary loss of 0.14 acres of nearshore habitat from the proposed bulkhead and dredging (until the eventual functioning of the mitigation site). The extent of incidental take from increased predation opportunity and decreased forage (both related to installation of new in- and overwater structures) is that which would accrue from the addition of 500 square feet of overwater structure and the seven dolphin structures (five using two 30-inch pilings and two using three 30-inch pilings). Finally, the extent of incidental take from pile driving is that which would accrue from driving 16 piles over the area within a 1800-foot radius of pile location.

### **2.2.2 Reasonable and Prudent Measures**

The measures described below are non-discretionary. They must be carried out so that they become binding conditions for the incidental take exemption in section 7(a)(2) to apply. The Corps has the continuing duty to regulate the activities covered in this incidental take statement. If the Corps fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms added to the document authorizing this action, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimize the likelihood of take of listed fish resulting from implementation of this Opinion.

1. Avoid or minimize incidental take due to dock construction by implementing these activities during the recognized in-water work window when the fewest number of juvenile OC coho salmon are likely to be present (November 1 through January 31).
2. Avoid or minimize incidental take due to pile driving by implementing measures to reduce the dB levels produced and extended to surrounding waters.
3. Avoid or minimize incidental take due to shallow water habitat loss by ensuring the mitigation/restoration site is developed, maintained, and reaches its full potential for shallow water habitat values.
4. Avoid or minimize incidental take due to redistribution of contaminated sediments during dock construction by conducting sediment testing and adhering to the Dredged Material Evaluation Framework (DMEF).
5. Avoid or minimize incidental take due to exposure to hazardous materials by developing a spill plan for construction and operation of the dock facilities.
6. Ensure completion of a comprehensive monitoring and reporting program to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

### **2.2.3 Terms and Conditions**

1. To implement reasonable and prudent measure #1 (in-water work), the Corps shall ensure that the applicant will implement in-water work during the recognized window of November 1 through January 31, unless otherwise approved in writing by NOAA Fisheries.
2. To implement reasonable and prudent measure #2 (pile driving), the Corps shall ensure that the applicant implements measures to attenuate the sound pressure levels produced by requiring the applicant to:

- a. Use the smallest driver and the minimum force necessary to complete the job. Use a vibratory hammer whenever feasible.
  - b. When using an impact hammer to drive or proof steel piles, one of the following sound attenuation devices will be used to reduce sound pressure levels by 20 dB.
    - i. Place a block of wood or other sound dampening material between the hammer and the piling being driven.
    - ii. If the currents are 1.7 miles per hour or less, surround the piling being driven by an unconfined bubble curtain that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column.
    - iii. If currents greater than 1.7 miles per hour, surround the piling being driven by a confined bubble curtain (*e.g.*, a bubble ring surrounded by fabric or metal sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.
    - iv. Other sound attenuation devices as approved in writing by NOAA Fisheries.
3. To implement reasonable and prudent measure #3 (mitigation site development), the Corps shall ensure that the applicant implements measures to develop and maintain a new shallow habitat site by requiring the applicant to:
- a. Implement the mitigation plan proposed in Appendix C of the BA (2003).
  - b. Monitor the success of the mitigation site development and planting by following the “success criteria” proposed in the Mitigation and Monitoring Plan (Appendix C of the BA 2003).
    - i. In addition to the information provided in the “Mitigation and Monitoring Plan,” provide a monitoring report that includes the following information:
      - (1) The name and address of the parties responsible for meeting each component of the mitigation plan.
      - (2) Performance standards for determining compliance.
      - (3) Any other pertinent requirements such as financial assurances, real estate assurances, monitoring programs, and the provisions for short and long-term maintenance of the restoration or mitigation site.
    - ii. A provision for Corps certification that all action necessary to carry out each component of the restoration or mitigation plan is completed, and that the performance standards are achieved.
4. To implement reasonable and prudent measure #4 (sediment testing), the Corps shall ensure that the applicant will minimize potential redistribution of sediment contaminants by:

- a. Not permitting dredging before conducting sediment testing and determining if sediment quality meets criteria for in-water disposal.
  - b. Reinitiating consultation if sediment testing does not conform to approved criteria.
  - c. Hydraulic dredge intakes will be placed at or just below the surface of the material being removed, although the intake may be raised for brief periods of purging or flushing.
  - d. If using a clamshell dredge, whenever feasible use one with finishing type bucket flaps.
  - e. Placing dredge spoil in an approved upland area that is large enough to allow settling, and where it cannot re-enter the waterbody.
5. To implement reasonable and prudent measure #5 (hazardous materials), the Corps shall ensure that:
- a. The applicant will prepare and carry out a pollution and erosion control plan to prevent pollution caused by construction operations and long-term dock operations. The plan must be available for inspection on request by Corps or NOAA Fisheries.
    - i. Plan Contents. The pollution and erosion control plan will contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.
      - (1) The name and address of the parties responsible for accomplishment of the pollution and erosion control plan.
      - (2) Practices to confine, remove and dispose of excess concrete, cement, grout, and other mortars or bonding agents, including measures for washout facilities.
      - (3) A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.
      - (4) A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.
      - (5) Practices to prevent construction debris from dropping into the river, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.
6. To implement reasonable and prudent measure #6 (monitoring), the Corps shall ensure that the applicant will complete the following monitoring activities to ensure that the proposed action is implemented as proposed by providing:

- a. Written planning requirements. Before beginning any work below MHHW elevation, the permittee will provide a copy of all the written plans, including Pollution and Erosion Control and Compensatory Mitigation, to the Corps and the Oregon Office of NOAA Fisheries at the following address:

Director, Oregon State Habitat Office  
Habitat Conservation Division  
National Marine Fisheries Service  
**Attn: 2002/01343**  
525 NE Oregon Street  
Portland, OR 97232

- b. Implementation report. The permittee submits an implementation monitoring report to the Corps and to NOAA Fisheries, at the address above, by July 31 of each year for the five years of mitigation site monitoring. The monitoring report will describe the permittee's success meeting his or her permit conditions and include the following information.
- i. Project identification
    - (1) Permittee name, permit number, and project name.
    - (2) Project location, including any compensatory mitigation site(s), by 5<sup>th</sup> field HUC and by latitude and longitude as determined from the appropriate USGS 7-minute quadrangle map.
    - (3) Corps contact person.
    - (4) Starting and ending dates for work completed.
  - ii. Project data.
    - (1) Dates of any dredging activity.
    - (2) A summary of turbidity monitoring reports.
    - (3) A summary of pollution and erosion control inspections, including any erosion control failure, contaminant release, and correction effort.
    - (4) Photographs of habitat conditions at any mitigation site, before, during, and after project completion.<sup>4</sup> Label each photo with date, time, project name, photographer's name, and a comment about the subject.
    - (5) Any other data or analyses the Corps or applicant believes is necessary or helpful to assess habitat trends in the action area.
    - (6) Mitigation plan reporting as described in term and condition #3.
- c. Salvage notice. The following notice is included as a permit condition.

---

<sup>4</sup> Relevant habitat conditions may include characteristics of clamshell, barge or onshore operations, channel conditions, eroding and stable streambanks in the project area, riparian vegetation, water quality, and other visually discernable environmental conditions at the project area.

If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Roseburg Field Office of NOAA Fisheries Law Enforcement at 541.957.3388. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

### **3. MAGNUSON-STEVENSON ACT**

#### **3.1 Background**

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), requires the inclusion of essential fish habitat (EFH) descriptions in federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of essential fish habitat, “waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate. “Substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities. “Necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle (50CFR600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;
- Federal agencies shall, within 30 days after receiving conservation recommendations from NOAA Fisheries, provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of

measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH.

Therefore, EFH consultation with NOAA Fisheries is required by federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

### **3.2 Identification of EFH**

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for federally-managed fisheries within the waters of Washington, Oregon, and California. Designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years) (PFMC 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC 1999).

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Casillas *et al.* (1998) provides additional detail on the groundfish EFH habitat complexes. Assessment of the potential adverse effects to these species' EFH from the proposed action is based, in part, on these descriptions and on information provided by the Corps and the ODFW.

The project area includes habitat which has been designated as EFH for various life stages of 25 species of groundfish and coastal pelagics, and two species of Pacific salmon (Table 4).

### **3.3 Proposed Actions**

The proposed actions are detailed above in section 1.3 of this Opinion. The action area is defined in section 1.4 and includes the Umpqua River within 1,800 feet of the dock construction site. The action area includes habitats that have been designated as EFH for various life-history stages of 20 species of groundfish, 5 coastal pelagic species, and two species of Pacific salmon (Table 3).

### **3.4 Effects of Proposed Action**

As described in detail in section 2.1.5 of the Opinion, the proposed action may result in adverse effects to habitat parameters and forage. These adverse effects are:

- Alteration of the Umpqua River channel bed due to bulkhead construction and dredging.
- Increased turbidity and settling of fine sediment onto the streambed.
- Alteration of macrophyte communities.
- Alteration of aquatic macroinvertebrate community composition.
- Potential exposure to hazardous materials.
- Loss of riparian function.
- Intense sound pressure waves.

Although the ESA assessment described the effects to OC coho salmon, these effects will potentially be different for the other EFH species. Seasonal timing was designed to minimize effects to juvenile coho salmon, but juvenile individuals of many of the other species may be within the action area during the in-water work window. Sound pressure waves affect smaller fish more significantly than larger, therefore, the use of sound attenuating measures during the pile driving is more imperative.

Development of the mitigation/restoration site has the potential to provide quality habitat for EFH species. Forage species and habitat features for EFH species is likely to be enhanced when this site reaches the full potential.

### **3.5 Conclusion**

NOAA Fisheries concludes that the proposed action will adversely affect EFH for Pacific salmon, groundfish and coastal pelagic species.

### **3.6 EFH Conservation Recommendations**

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. While NOAA Fisheries understands that the conservation measures described in the biological assessment will be implemented, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. The incidental take statement includes

reasonable and prudent measures and terms and conditions, that are sufficient to avoid jeopardy to OC coho salmon, but still allow adverse effects to EFH for Pacific salmon, groundfish and coastal pelagic species. Accordingly, NOAA Fisheries recommends that the Corps implement the following conservation measures to minimize the potential adverse effects to EFH (Hanson, *et al.* 2003).

1. Ensure sound pressure waves do not exceed 155 dB.
2. Drive piles during low tide periods.
3. Use a vibratory hammer when driving hollow steel piles. Under those conditions where impact hammers are required for reasons of seismic stability or substrate type, it is recommended that the pile be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer.
4. Monitor peak SPLs during driving to ensure that they do not exceed the 190 dB for injury to fish.
5. Implement measures to attenuate the sound should SPLs exceed the 180 dB threshold. If sound pressure levels exceed acceptable limits, implement mitigative measures. Methods to reduce the SPLs include were describe in term and condition #2.
6. Drive piles when the current is reduced (*i.e.*, centered around slack current) in areas of strong current to minimize the number of fish exposed to adverse levels of underwater sound.

### **3.7 Statutory Response Requirement**

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

### **3.8 Supplemental Consultation**

The Corps must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(k)).

**Table 3.** Species with designated EFH in the Estuarine EFH Composite in the State of Oregon.

<b>Groundfish Species</b>	
Leopard Shark (southern OR only)	<i>Triakis semifasciata</i>
Soupfin Shark	<i>Galeorhinus zyopterus</i>
Spiny Dogfish	<i>Squalus acanthias</i>
California Skate	<i>Raja inornata</i>
Spotted Ratfish	<i>Hydrolagus colliei</i>
Lingcod	<i>Ophiodon elongatus</i>
Cabazon	<i>Scorpaenichthys marmoratus</i>
Kelp Greenling	<i>Hexagrammos decagrammus</i>
Pacific Cod	<i>Gadus macrocephalus</i>
Pacific Whiting (Hake)	<i>Merluccius productus</i>
Black Rockfish	<i>Sebastes maliger</i>
Bocaccio	<i>Sebastes paucispinis</i>
Brown Rockfish	<i>Sebastes auriculatus</i>
Copper Rockfish	<i>Sebastes caurinus</i>
Quillback Rockfish	<i>Sebastes maliger</i>
English Sole	<i>Pleuronectes vetulus</i>
Pacific Sanddab	<i>Citharichthys sordidus</i>
Rex Sole	<i>Glyptocephalus zachirus</i>
Rock Sole	<i>Lepidopsetta bilineata</i>
Starry Flounder	<i>Platichthys stellatus</i>
<b>Coastal Pelagic Species</b>	
Pacific Sardine	<i>Sardinops sagax</i>
Pacific (Chub) Mackerel	<i>Scomber japonicus</i>
Northern Anchovy	<i>Engraulis mordax</i>
Jack Mackerel	<i>Trachurus symmetricus</i>
California Market Squid	<i>Loligo opalescens</i>
<b>Pacific Salmon Species</b>	
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
Coho Salmon	<i>Oncorhynchus kisutch</i>

#### 4. LITERATURE CITED

- Able, K.W., J.P. Manderson, A.L. Studholme. The distribution of shallow water juvenile fishes in an urban estuary: the effects of man-made structures in the lower Hudson River. *Estuaries* 21:731-744.
- BA (biological assessment). 2003. Effects of American Bridge Company's Bolon Island Dock Replacement Project on Oregon Coast Coho Salmon, Oregon Coast Steelhead, and Pacific Coast Fishery Management Species Essential Fish Habitat. S.P. Cramer & Associates, Inc.
- Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *in* W.R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:83-138.
- Blanton, S.L., R.M. Thom, J.A. Southard. 2001. Documentation of ferry terminal shading, substrate composition, and algal and eelgrass coverage. Letter report prepared for University of Washington, School Aquatic and Fishery Sciences, Seattle, Washington, by Battelle Marine Sciences Laboratory, Sequim, Washington. 17 p.
- Botkin, D., K. Cummins, T. Dunne, H. Regier, M. Sobel, and L. Talbot. 1995. Status and future of salmon of western Oregon and northern California: findings and options. Report #8. The center for the study of the environment, Santa Barbara, California.
- Bottom, D.L. and K.K. Jones. 1990. Community structure, distribution, and invertebrate prey of fish assemblages in the Columbia River estuary. *Progress in Oceanography* 25: 211-241.
- Bottom, D.L., K.K. Jones and M.J. Herring. 1984. Fishes of the Columbia River Estuary. Portland, Oregon Department of Fish and Wildlife. Oregon.
- Brett, J.R., W.C. Clarke, and J.E. Shelbourn, 1982. Experiments on thermal requirements for growth and food conservation efficiency of juvenile chinook salmon (*Oncorhynchus tshawytscha*). Canadian Technical Report of Fisheries and Aquatic Sciences No. 1127. Department of Fisheries. Oceans, Fisheries Research, Pacific Biological Station, Nanaimo, B.C.
- BRT (Biological Review Team). 2003. Preliminary conclusions regarding the updated status of West Coast salmon and steelhead, Part C – Coho salmon, Co-manager review draft. West Coast Biological Review Team, Northwest Fisheries Science Center and Southwest Fisheries Science Center (February 2003). Available online at: <http://www.nwfsc.noaa.gov/trt/btr/btrrpt.cfm>.

- Casillas, E., L. Crockett, Y. deReynier, J. Glock, M. Helvey, B. Meyer, C. Schmitt, M. Yoklavich, A. Bailey, B. Chao, B. Johnson, and T. Pepperell,. 1988. Essential Fish Habitat West Coast Groundfish Appendix. National Marine Fisheries Service. Seattle, Washington. 778 p.
- Dawley, E. , R.D. Ledgerwood, T.H Blahm, C.W. Sims, .T. Durkin, R.A. Kirn, A.E. Rankis, G.E. Monan, and F.J. Ossiander. 1986. Migrational characteristics, biological observations, and relative survival of juvenile salmonids entering the Columbia River estuary, 1966-1983. Final Report to the Bonneville Power Administration, Portland, OR. 256 pp.
- Duffy-Anderson, J.T. and K.W. Able. 1999. Effects of municipal piers on the growth of juvenile fishes in the Hudson River estuary: a study across a pier edge. *Marine Biology* 133:409-418.
- Feist, B.E. 1991. Potential impacts of pile driving on juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon behavior and distribution. University of Washington, School of Fisheries.
- Feist, B.E. and J.J. Anderson, and R. Miyamoto. 1992. Potential impacts of pile driving on juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O.keta*) salmon behavior and distribution. University of Washington. Fisheries Research Institute, FRI-UW-9603. May1992.
- Feist, B. E., J. J. Anderson, and R. Miyamoto. 1996. Potential impacts of pile driving on juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon behavior and distribution. Report No. FRI-UW-9603. Fisheries Research Institute, School of Fisheries, Univ. of Washington, Seattle, WA. 58p.
- FEMAT (Forest Ecosystem Management Assessment Team). 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. U.S. Government Printing Office 1993-793- 071. U.S. Government Printing Office for the U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Land Management, and National Park Service; U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service; and the U.S. Environmental Protection Agency.
- Glasby, T.M. 1999. Effects of shading on subtidal epibiotic assemblages. *Journal of Experimental Marine Biology and Ecology* 234: 275-290.  
<http://www.sciencedirect.com/sciencejournal/00220981>

- Hanson, J., M. Helvey, and R. Strach (editors). 2003. Non-fishing impacts to essential fish habitat and recommended conservation measures. Version 1. National Marine Fisheries Service (NOAA Fisheries), Alaska Region, Northwest Region, Southwest Region. Available online at <http://swr.nmfs.noaa.gov/EFH-NonGear-Master.PDF>
- Haas, M.A., C.A. Simenstad, Jr., J.R. Cordell, D.A. Beauchamp, B.S. Miller. 2002. Effects of large overwater structures on epibenthic juvenile salmon prey assemblages in Puget Sound, Washington. Prepared for the Washington State Transportation Commission, Washington Highway Administration. Final research report No. WA-RS 550.1. 114 p. (<http://depts.washington.edu/trac/bulkdisk/pdf/550.1.PDF>)
- Hatch, A.C. and G.A. Burton Jr. 1999. Photo-induced toxicity of PAHs to *Hyaletta azteca* and *Chironomus tentans*: effects of mixtures and behavior. *Environmental Pollution* 106(2): 157-167.
- Helfman, G.S. 1981. The advantage to fish of hovering in shade. *Copeia*(2):392-400.
- Holtby, L.B., Anderson, B.C., and Kadowaki, R.K. 1990. Importance of smolt size and early ocean growth to interannual variability in marine survival of coho salmon (*Oncorhynchus kisutch*). *Can. J. Fish. Aquat. Sci.* 47:2181-2194.
- Ireland, D.S., G.A. Burton Jr., and G.G. Hess. 1996. In situ toxicity evaluations of turbidity and photoinduction of polycyclic aromatic hydrocarbons. *Environmental Toxicology and Chemistry* 15(4): 574-581
- Kahler, T., M. Grassley, and D. Beauchamp. 2000. A summary of the effects of bulkheads, piers, and other artificial structures and shorezone development on ESA-listed salmonids in lakes. Final report, 13 July, 2000. Prepared for the City of Bellevue, Washington by the Watershed Company, Kirkland, Washington, and Washington Cooperative Fish and Wildlife Research Unit, Univ. of Washington, Seattle, WA. 78p.
- Klein, R. 1997. The effects of marinas and boating activities upon tidal waters. Owing Mills, MD: Community and Environmental Defense Services. 23 p.
- Kostow, K., Editor. 1995. Biennial report on the status of wild fish in Oregon. Oregon Department of Fish and Wildlife.
- Kruzic, L. M. 1998. Analysis of the Benefits of Management Actions Taken to Reduce Hatchery and Harvest Impacts to Natural Steelhead in the Oregon Coast and Klamath Mountains Province ESUs. NOAA Fisheries Memo to the Record. Portland, Oregon. 10 p.
- McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-42, 156 p.

- McMahon, T.E., and L.B. Holtby. 1992. Behavior, habitat use, and movements of coho salmon (*Oncorhynchus Kisutch*) smolts during seaward migration. *Canadian Journal of Fisheries and Aquatic Sciences* 49:1478-1485.
- Miller, B.A., and S. Sadro. 2003. Residence time and seasonal movements of juvenile coho salmon in the ecotone and lower estuary of Winchester Creek, South Slough, Oregon. *Transactions of the American Fisheries Society*, 132:546–559.
- Monson, P.D., G.T. Ankley, and P.A. Kosian. 1995. Phototoxic response of *Lumbiculus variegatus* to sediments contaminated by polycyclic aromatic hydrocarbons. *Environmental Toxicology and Chemistry* 14(5): 891-894.
- Neff, J.M. 1985. Polycyclic aromatic hydrocarbons. *In: Fundamentals of aquatic toxicology*, G.M. Rand and S.R. Petrocelli, p. 416-454. Hemisphere Publishing, Washington, D.C.
- Newcombe, C. P., and D. D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. *North American Journal of Fisheries Management* 11: 72-82.
- Newcombe, C. P., and J. O. Jensen 1996. Channel suspended sediment and fisheries: A synthesis for quantitative assessment of risk and impact. *North American Journal of Fisheries Management*. 16(4): 693-727.
- Nickelson, T.E., J.W. Nicholas, A.M. McGie, R.B. Lindsay, D.L. Bottom, R.J. Kaiser, and S.E. Jacobs. 1992. Status of anadromous salmonids in Oregon coastal basins. Oregon Department of Fish and Wildlife, Research Development Section and Ocean Salmon Management, 83 p. Oregon Department of Fish and Wildlife, P.O. Box 59, Portland.
- NOAA Fisheries (National Marine Fisheries Service). 1999. Habitat conservation and protected resources divisions. *The Habitat Approach: Implementation of Section 7 of the Endangered Species Act for action affecting the habitat of Pacific anadromous salmonids*.
- NOAA Fisheries (National Marine Fisheries Service). 2002a. Biological Opinion on the North Umpqua Hydroelectric Project. Northwest Region, Habitat Conservation Division, Portland, Oregon. December 13, 2002.
- OCSRI (Oregon Coastal Salmon Restoration Initiative). 1997. State of Oregon, Salem. March 10, 1997.
- ODFW (Oregon Department of Fish and Wildlife). 1995. Biennial report on the status of wild fish in Oregon. Portland, Oregon. 217 pp.
- ODFW. 2003a. Data from <http://query.streamnet.org>

- ODFW. 2003b. Coastal Salmonid Inventory Project. Coho Abundance: Stratified Random Sampling Estimates for Coastal River Basins 1990-2002. Available online at: <http://oregonstate.edu/Dept/ODFW/spawn/coho.htm>, accessed August 2003.
- PFMC (Pacific Fishery Management Council), 1998a. Final Environmental Assessment/Regulatory Review for Amendment 11 to the Pacific Coast Groundfish Fishery Management Plan. October 1998.
- PFMC (Pacific Fishery Management Council), 1998b. The Coastal Pelagic Species Fishery Management Plan: Amendment 8. Portland, Oregon.
- PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.
- Ratti, F. 1979. Natural Resources of Umpqua Estuary. Oregon Department of Fish and Wildlife, Portland, Oregon. 59 pp.
- Rich, A.A. 1987. Water temperatures which optimize growth and survival of the anadromous fishery resources of the lower American River. Unpublished report prepared for McDonough, Holland and Allen. Sacramento, CA.
- Salo, E.O. 1991. Life history of chum salmon (*O. keta*). Pacific salmon life histories. C. Groot and L. Margolis. Vancouver, University of British Columbia Press: 231-310.
- Smith, J.J. and H.W. Li. 1983. Energetic factors influencing foraging tactics of juvenile steelhead trout, *Salmo gairdneri*. In Noakes *et al.*, eds. Predators and prey in fishes. Dr. W. Junk Publishers. The Hague, Netherlands.
- SPCA. 2002. Biological Assessment: Effects of Bolon Island infrastructure improvements project on Oregon Coast Coho salmon, Oregon Coast steelhead, and Pacific Coast fishery management species essential fish habitat. Prepared for the Economic Development Administration, Seattle, Washington, and Douglas County, Roseburg. Prepared by S.P. Cramer & Associates, Inc. (SPCA), Gresham, Oregon.
- Spence, B.C., G.A. Lomnický, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, Oregon. Available online at: <http://www.nwr.noaa.gov/1habcon/habweb/ManTech/front.htm>

Steelquist, R. 1992. Field guide to the Pacific salmon. Sasquatch Books. Seattle, Washington.

Warrington, P. D. 1999b. Impacts of outboard motors on the aquatic environment.

<http://www.nalms.org/bclss/impactsoutboard.htm>

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.